Pumping limitations of the TTF3 coupler and its vacuum connections

Jerzy Wojtkiewicz

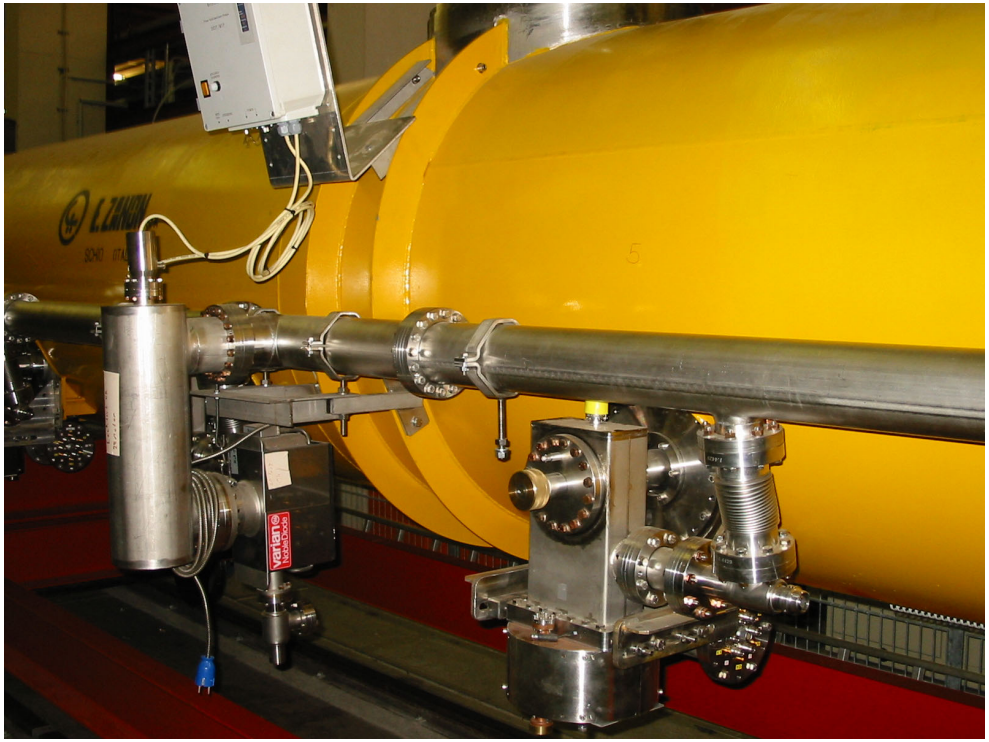
XFEL Coupler Meeting, DESY, Nov. 25/03

Content

- Pumping at module
- Pumping at Chechia

Pumping at Module

- **common pump line for 8 couplers of each module**
  - diameter: 100 mm
  - total length: 10 m
- **Titanium Sublimation Pump in combination with Ion Getter pump**
  - located at middle of pump line
  - pumping speed: TSP 1000 l/s
  - Ion getter pump 60 l/s



- **connection of individual couplers by manual valve and bellows**
  - FERMI coupler: valve 16 mm, bellows 16 mm
  - DESY II coupler: valve 35 mm, bellows 63 mm
  - DESY III coupler: valve 35 mm, bellows 35 mm

Total Pumping Speed

$$1/S_{tot} = 1/S_{pump} + 1/C_{pump\ line} + 1/C_{coupler\ connection}$$

- **common pump line**
  - conductance $C_{pump\ line}$ = 23 l/s (for coupler 1 or 8)
- **coupler connection between pump line and coupler**
  - FERMI $C_{coupler}$ = 2 l/s
  - DESY II $C_{coupler}$ = 18 l/s
  - DESY III $C_{coupler}$ = 13 l/s
- **total pumping speed to outer coupler (1 or 8)**

FERMI: S_{tot} = 2 l/s
DESY II: S_{tot} = 10 l/s
DESY III: S_{tot} = 8 l/s

➡ **dominated by coupler connection!**

Conductance inside coupler (DESY III)

- **“outer part” of coupler**
  - conductance of the coupler is bigger than total pumping speed of the pumping connections
  - warm window to pump port: C = 80 l/s
  - cold window to pump port: C = 53 l/s
- **“inner part” of coupler**
  - about 17 l/s to outer coupler part
- **expected pressure**
  - outgassing rate q = 10^{-11} mbar l/s/cm^2

outer coupler part: p = 3•10^{-9} mbar
inner coupler part: p = 3•10^{-9} mbar

Pumping at Checia

- **pump line for 1 coupler**
  - diameter: 35 mm/63 mm
  - total length: 1.3 m
- **Ion Getter pump**
  - pumping speed: 60 l/s
- **connection to coupler by manual valve and bellows**
  - DESY III coupler: valve 35 mm, bellows 35 mm

Total Pumping Speed

$$1/S_{tot} = 1/S_{pump} + 1/C_{pump\ line} + 1/C_{coupler}$$

- **pump line and coupler connection (DESY III)**
  - conductance $C_{pump\ line}$ = 4 l/s
- **Total pumping speed**

DESY III: S_{tot} = 4 l/s

➡ **dominated by pump line!**
➡ **pumping speed in Chechia factor 2 lower than in module!!!**

Summary

- Geometry of warm coupler part reasonable with respect to conductance
- Pump speed in module dominated by coupler connection
- Pump speed in Chechia dominated by pump line
- Pumping speed in Chechia factor 2 lower than in module!!!